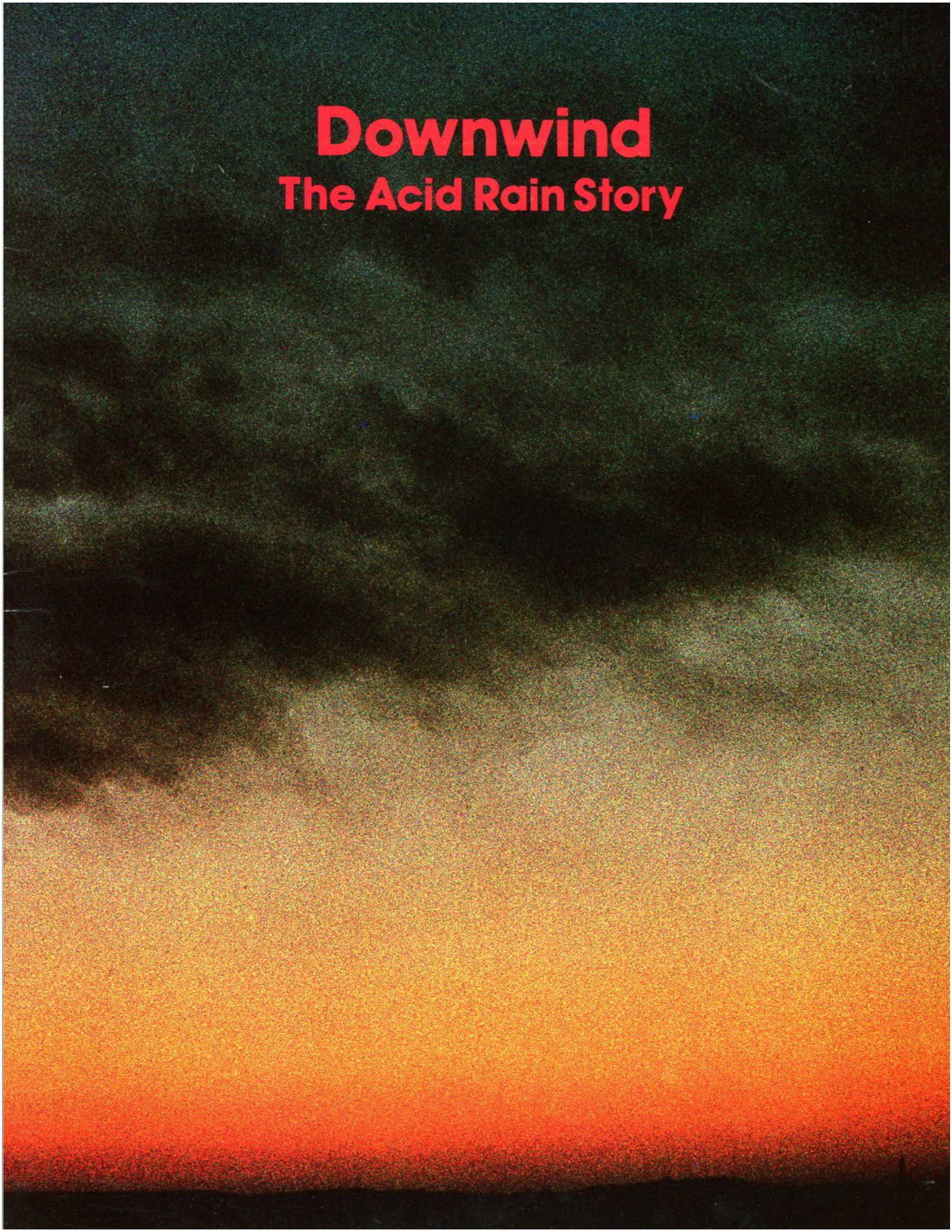
Downwind
The Acid Rain Story



"Acid rain is a striking paradigm for so many of our environmental problems. Its scope is international. Its causes are scattered in a variety of countries. Its consequences extend far beyond national boundaries. And its successful resolution will require co-operative international action."

The Honourable John Roberts
Minister of the Environment
from a speech to The American
Association for the Advancement
of Science, Jan. 4, 1981.

Foreword

There is little doubt that acid precipitation is affecting the people of the North American continent, has affected us for some time. If unchecked it may gravely affect future generations.

The concerns of Canada have been expressed many times through Environment Canada, External Affairs and other federal and provincial agencies. It is acknowledged that researchers do not fully understand this problem yet, but there is clear evidence that it is damaging our environment and that its effects may be irreversible.

This publication attempts to give an overview of the situation so that readers may know why we consider acid rain an ominous threat. We think it is a serious pollution problem — perhaps the most serious pollution problem — and we leave the reader to make a judgement after reading the facts.

Environment Canada Environnement Canada

"The Adirondacks are the greatest wilderness left east of the Mississippi," says Anne LaBastille, a commissioner with the Adirondacks Parks Agency in New York. "It's just an overpoweringly beautiful area of mountains and lakes, streams and swamps, and forests which have not been cut since 1894, thank God, because of the state's 'Forever Wild' clause.

"It's also a tourist mecca," she says. "Because it is a really rugged and difficult place to live, there are only 125 000 permanent residents. But we get 9 000 000 tourists a year."

The Adirondacks are also victims of the most serious environmental problem we face today — acid rain. It has already caused tragic and irreparable damage to this scenic paradise and will continue to destroy it—and many other parts of the world—unless this deadly pollution is stopped.

The Forecast

It sounds like a screenplay for a science fiction movie: a planet where invisible gases undergo a transformation as they travel among the clouds, eventually falling to earth — sometimes thousands of kilometres from their source — as acids capable of crippling and killing the environments they invade.

But this, unfortunately, is the chilling reality of what is happening at this very moment throughout North America and Scandinavia especially, as well as in other countries.

Watching the rain drop gently onto a remote lake a thousand kilometres from the nearest industrial center, it is difficult to look at the rainbow forming in the misty sunlight and accept that what has just fallen is slowly killing most of the life within that innocent body of water. But already, in Canada and the United States, thousands of rivers and lakes are "dead" — no longer able to support fish and plant populations — and many thousands more are endangered. In Norway and Sweden, where the damage is more advanced, the total is in tens of thousands.

The problem is acid rain, an insidious but deadly pollution resulting from industrial combustion. As well as killing fish populations and aquatic vegetation, it threatens forests, crops and soils; erodes building and automobile surfaces; and may be a danger to human health.

The forecast for the immediate and distant future is bleak. The present and potential destruction caused by acid rain is staggering, both economically and aesthetically. The consequences of not ending this man-made pollution are simply not acceptable.

But we are not helpless or without hope, for the problem can be solved. What man has started, man can stop. That decision, however, will have to be made by us.

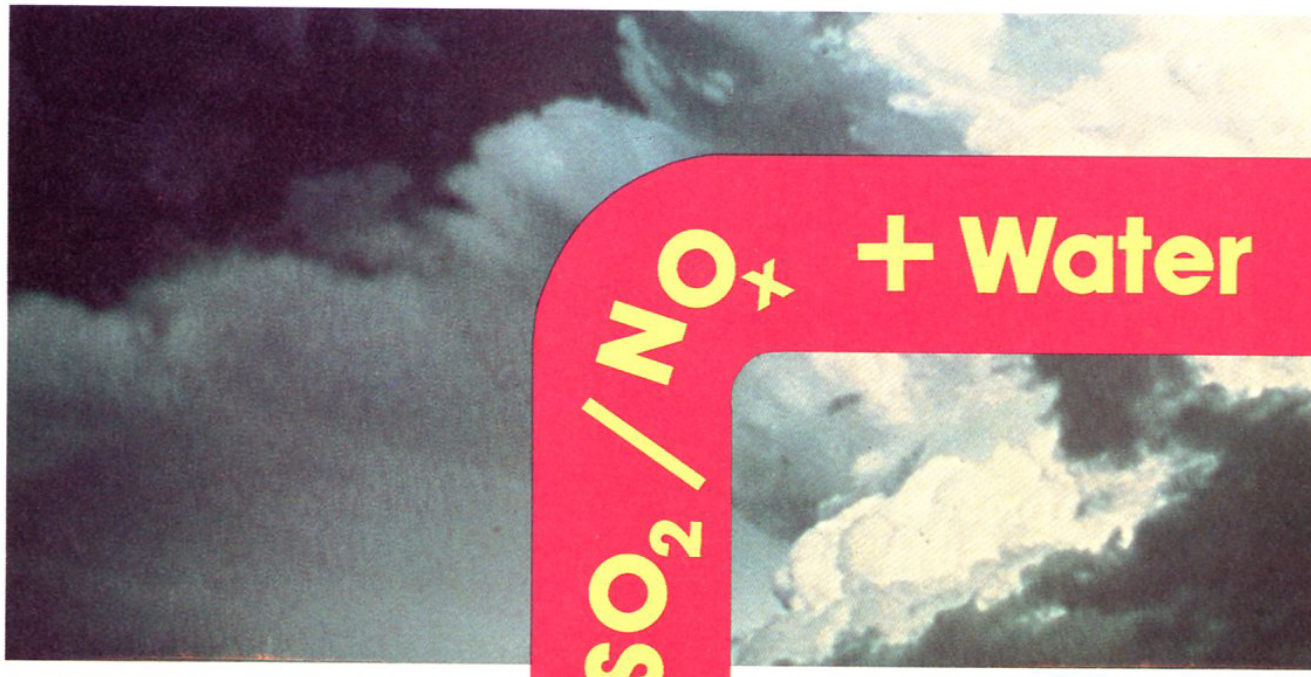
One of the most terrible aspects of acid rain is its ability to travel thousands of kilometres in the atmosphere before falling to earth. The rain dropping on this remote Canadian wilderness area contains pollutants which originated in industrial plants in the United States.

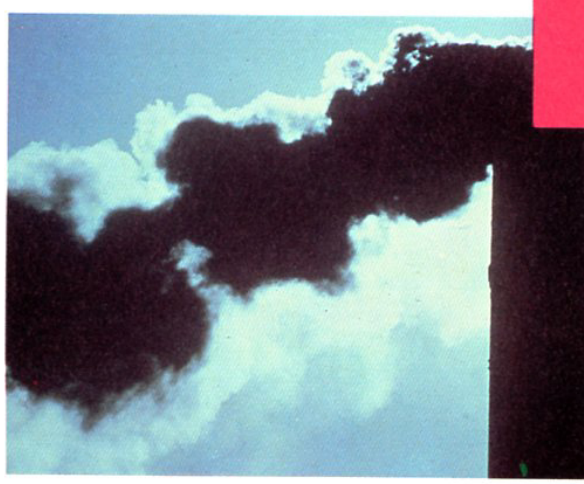
Where Does Acid Rain Come From?

It begins in the towering smokestacks of smelters and fossil-fueled power plants, oil refineries and other industrial funnels; and in the exhaust pipes of millions of overused cars that clog our major cities. Daily, thousands of tonnes of invisible gas — the oxides of sulfur and nitrogen primarily — stream into the atmosphere, following the winds on a journey that can last as long as several weeks (although on average they remain aloft for 2 to 5 days) and take them thousands of kilometres from their point of origin.

As these invisible clouds of sulfur dioxide and nitrogen oxides journey in the wind currents, enough time passes for chemical reactions to take place which convert them into acid-causing sulfates and nitrates. While the conversion of sulfur dioxide is rather slow, nitrogen oxides may be transformed almost instantly.

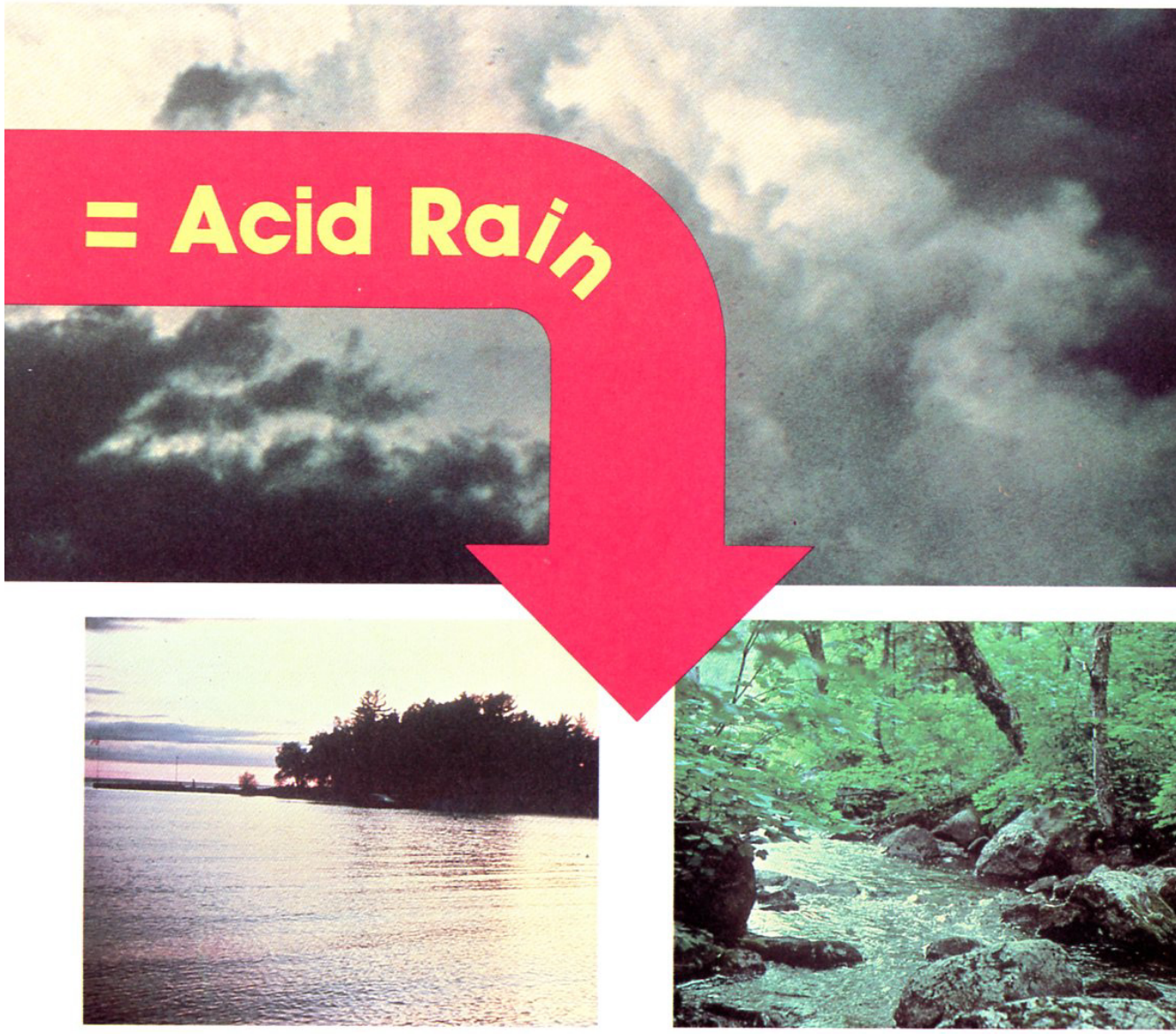
As every grade school child knows from watching teacher toss an apple into the air in imitation of Sir Isaac Newton, what goes up — inevitably — must come back down. For sulfuric acid and nitric acid, the return trip to the earth's surface comes with every rainstorm and snowfall of the seasons. Mixing with the water vapors in the clouds they travel in, they eventually tumble down to earth as acid rain and acid snow.





Sulfur dioxide (SO_2) makes up about 70 percent of acid rain while nitrogen oxides (NO_x) account for most of the rest. In Canada, sulfur dioxide comes primarily from smelters such as those of the International Nickel Company (INCO) plant in Sudbury, Ontario; or from the various Ontario Hydro fossil-fueled power plants throughout that province. In the United States, most SO_2 originates from the burning of fossil fuels such as oil and coal to produce electricity. The worst area is the upper Ohio valley (eastern Ohio, northern West Virginia, and western Pennsylvania) where high-sulfur coal is burned with little control over the amount of sulfur dioxide emitted.

In both countries, about half of the NO_x emissions come from the transportation sector, particularly from the tailpipes of moving vehicles. Electrical utilities and other combustion sources account for the rest.



Wet and Dry Deposition

The problem has been labeled "acid rain". More precisely, though, it should be called acid deposition.

Wet deposition refers to acid rain, acid snow and acid smog (acid smog occurs in large cities such as Los Angeles, California where there is an overabundance of automobiles).

Dry deposition refers to the dry particles of SO_x and NO_x which fall to earth before they have time to change into sulfuric and nitric acid as they travel in the clouds. These particles, however, carry molecules which can become acidic when mixed with surface water, rain, fog, dew or mist. The dry deposition is just as harmful as the wet, and is falling in approximately equal amounts to the wet.

In this booklet, the popular term "acid rain" will be used to represent the overall problem of acid deposition.

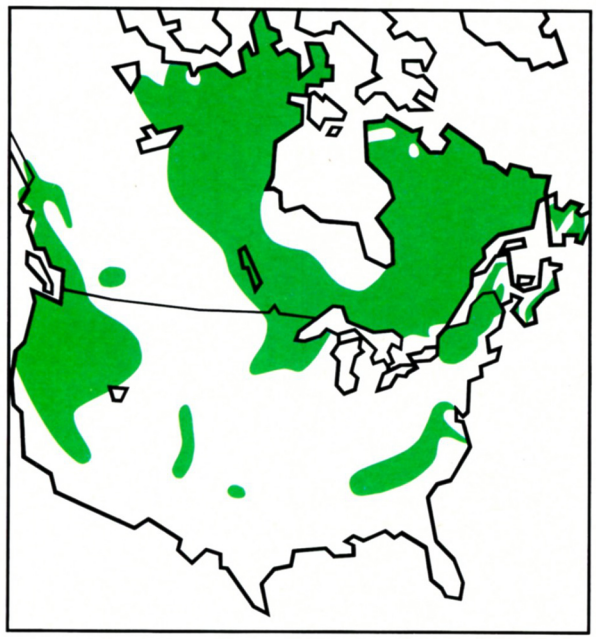
Long Range Transportation

The long range transportation of airborne pollution is not a new phenomenon. Deposits of red Sahara dust were observed in England in 1755; and in 1950, a savage forest fire in Alberta produced a smoke pall which was seen five days later in many European locations.

Most acid materials fall to earth within a few hundred to a few thousand kilometres from their point of origin. This provides time for them to cross state, provincial and international borders, creating an environmental and political problem that is not dealt with in existing legislation among the world's countries.

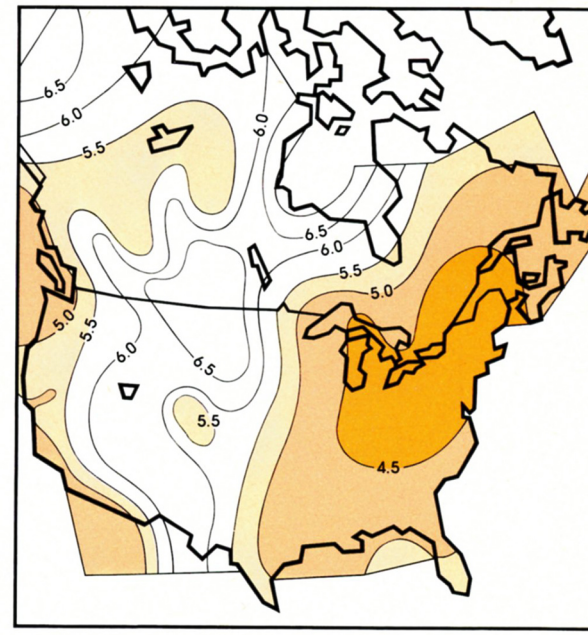
The United States is the largest producer of sulfur dioxide in the world, emitting 25.7 million tonnes a year, compared to Canada's total of 5 million tonnes. Because of the prevailing winds, large quantities of American SO_2 are blown into Canada, falling on areas such as Muskoka-Haliburton, the heartland of Ontario's tourist industry; onto Quebec, which is extremely acid-sensitive; and as far east as Nova Scotia and Newfoundland.

It is difficult to determine precisely how much crosses the 49th parallel and falls on Canada. "The state of the science is such that any estimates about the amount coming across the border are uncertain," says Dr. Douglas Whelpdale of Environment Canada's Atmospheric Environment Service, the scientific body responsible for tracking acid rain in Canada. "But the studies we have done," he says, "lead us to believe that about half of the sulfur coming into the atmosphere over eastern Canada comes from the United States." But it is not just a one-way street. "We send back an amount equal to about one-quarter to maybe a third of what they send us," he adds. The United States, therefore, is responsible for about half of Canada's acid rain. Canada, in turn, is the source of about 10-15 percent of the acid rain in the United States.

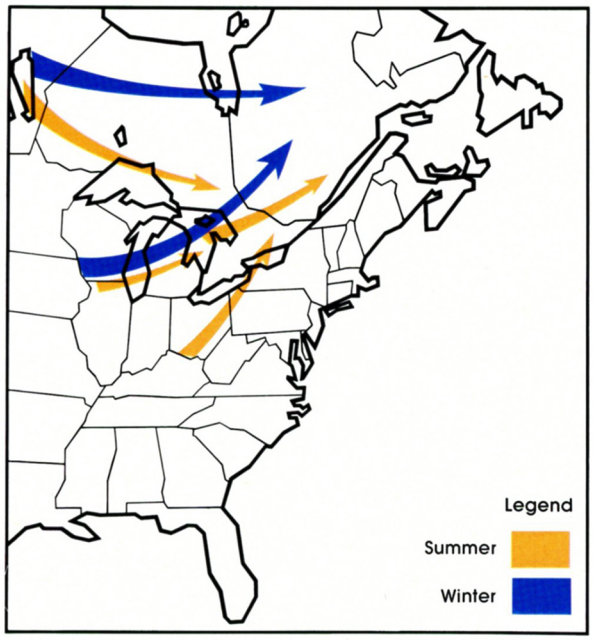


Approximate areas in North America containing lakes sensitive to acid precipitation

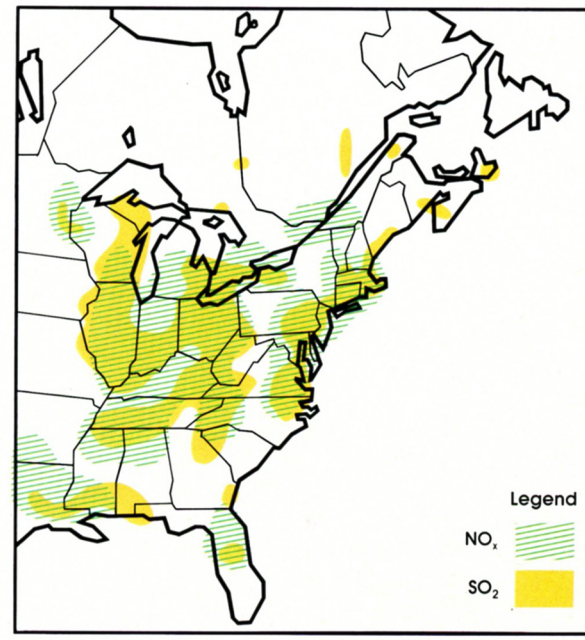
Source: Ontario Ministry of the Environment



Regions receiving acid rain.



Important Summer and Winter storm paths



Distribution of emissions of Sulphur Dioxide (SO_2) and Nitrous Oxides (NO_x)

Source: Ontario Ministry of the Environment

Drowning Worms

Dr. Harold Harvey, a professor of zoology at the University of Toronto, stood on a hill overlooking Lumsden Lake in Ontario and sighed as he watched the picture postcard scene below him. In the middle of a lake a lone fisherman slouched peacefully in a boat, enjoying the pleasure of his solitude as the sun winked off the tips of the sheer blue water. "As I looked down," recalls Harvey, "all I could think of was, the poor guy doesn't know it, but he's not fishing. All he's doing is drowning worms."

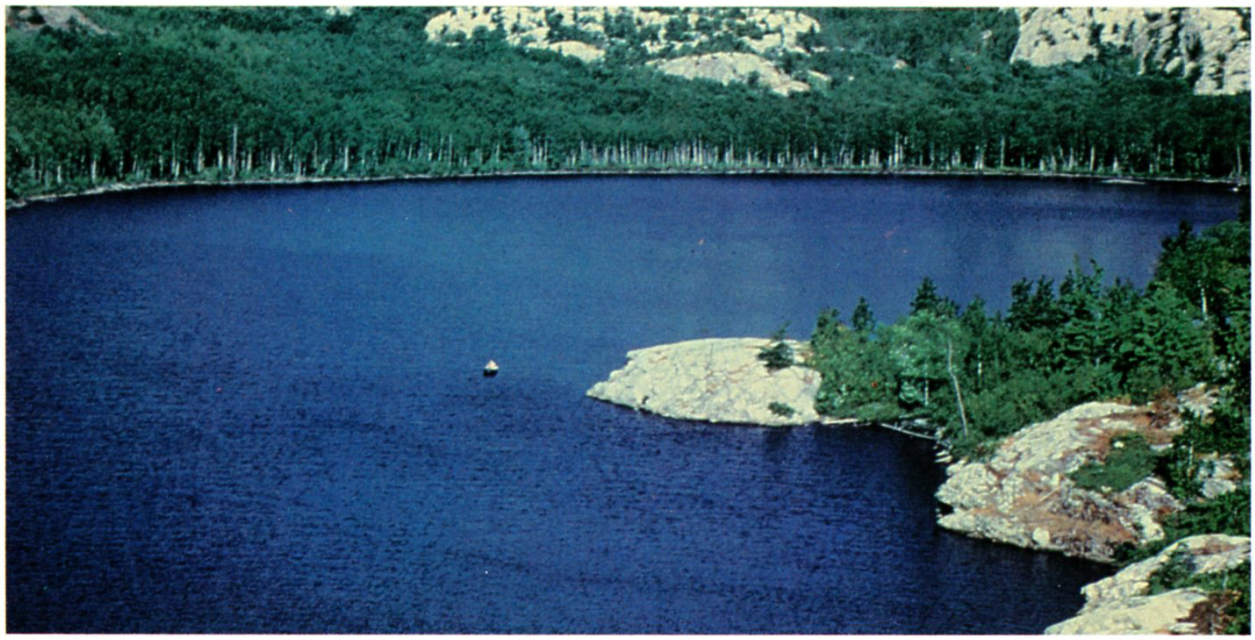
It is a chilling and ironic twist that as a lake acidifies it becomes more attractive; for as the various life forms within it die off, the water clears and appears to be in radiant health — until you look beneath the surface. This sinister paradox has also made it difficult to rouse attention to the problem. "If you look at a stream or lake and you see an old tire in it or it stinks, then it's easier to demonstrate to people that in fact there is some environmental damage being done," says Ron Reid of the Federation of Ontario Naturalists. "But if it's crystal clear and it looks beautiful, it's so difficult to see the effects. You know it sounds like yellow journalism, like something out of 2001 when you talk about the rain essentially being a rain of death. Most people initially find that rather hard to accept."

No Metal Umbrellas

If our contemplative fisherman were suddenly caught in an acid rainstorm, there would be no need for him to seek cover or hoist a metal umbrella. Apart from getting soaked, he would suffer no burns, taste no bitter liquid. For it is not the result of a single storm that makes acid rain so harmful. The acids are too dilute for that to happen. Rather, it is the slow and insidious build-up over a long period of time, the "loading" effect, that gradually wears away the ability of an environment to neutralize the constant doses of acid.

Some parts of the United States and Canada have a natural capacity to neutralize the acid, usually a limestone base in the soil or water body. But large sections of northeastern United States and eastern Canada, especially, do not — and they are extremely vulnerable. Most of the Canadian Shield, an area of some 2.5 million square kilometres, is very susceptible to acid rain.

In the late 1960s, scientists discovered that entire populations of fish had disappeared from Lumsden Lake in northern Ontario. This and other lakes in the La Cloche Mountains were some of the first known victims of acid rain in North America.



The pH Scale

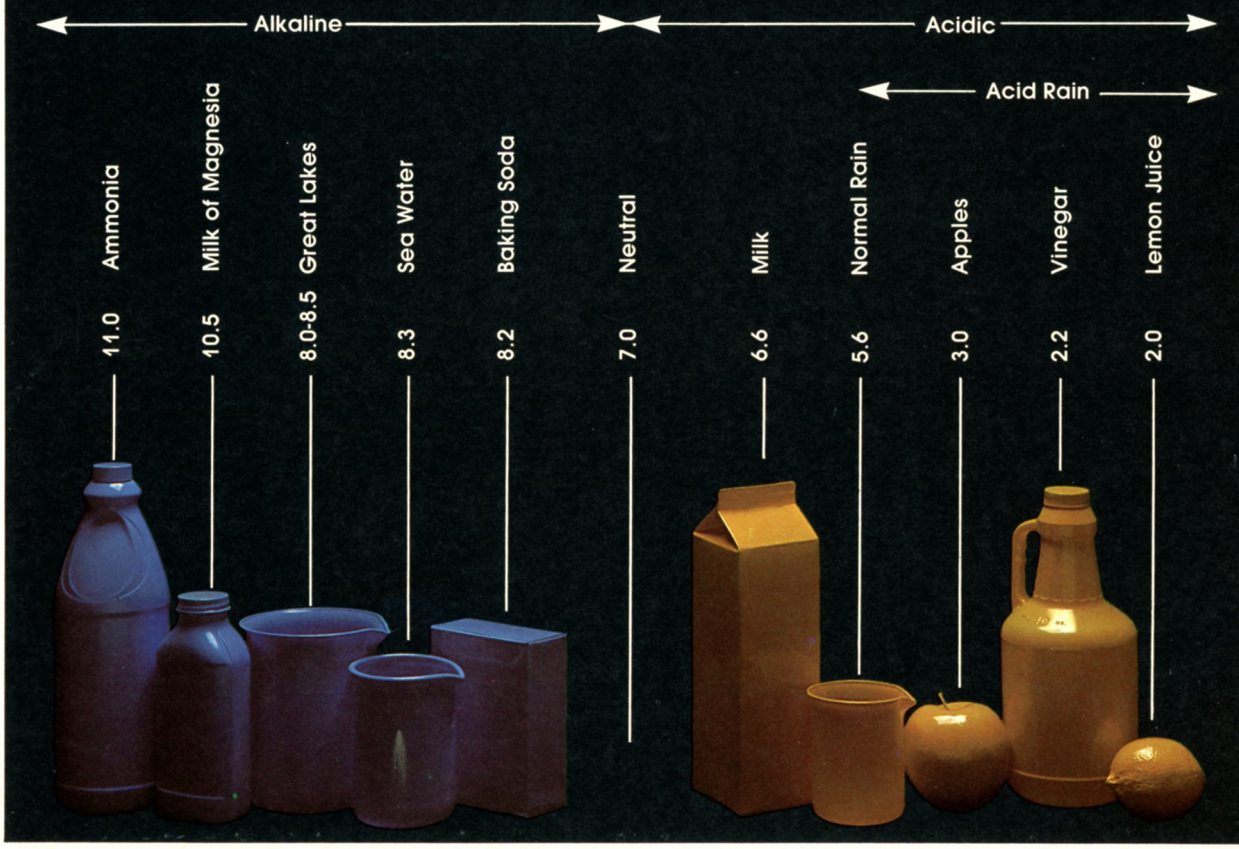
The residents of the highland town of Pitlochry, Scotland, thought it nothing unusual that it was raining on the morning of April 20, 1974. Sunshine might have caused a stir, but hardly rain. The rain that fell, however, **was** unusual for it had the acidic equivalent of vinegar with a pH reading of 2.4, the lowest ever recorded in Europe.

In order to understand how acid rain affects the environment, a brief chemistry lesson is required. A scale, known as the pH scale, ranging from 0 to 14, is used to measure whether a liquid or soil is acidic or alkaline (basic). A value of 7 is neutral. Values below 7 indicate progressively greater acidity; values above 7 indicate greater alkalinity.

Because the scale is logarithmic, there is a tenfold difference between one number and the one next to it. Therefore, if the pH drops from 7 to 6, the acidity is ten times greater; if it drops from 7 to 5, it is one hundred times greater; from 7 to 4, one thousand times greater and so on.

It does not take a tremendous increase in acidity to lower the pH of a lake, for example, from 7 to 6. But it does take a large amount to move it down several notches to 5.8 or 5.7. By the time the pH is 5, the increase in acid is enormous; and it continues to increase proportionately as it dips even further.

Normal rain is slightly acidic (because of such substances in the air as carbon dioxide) and has a pH of 5.6. Below 5.6 is considered abnormally acidic. The pH of the average rainfall in eastern Ontario and northeastern United States is now somewhere between 4.5-4; and many individual storms have a much lower pH.



Acid Shock

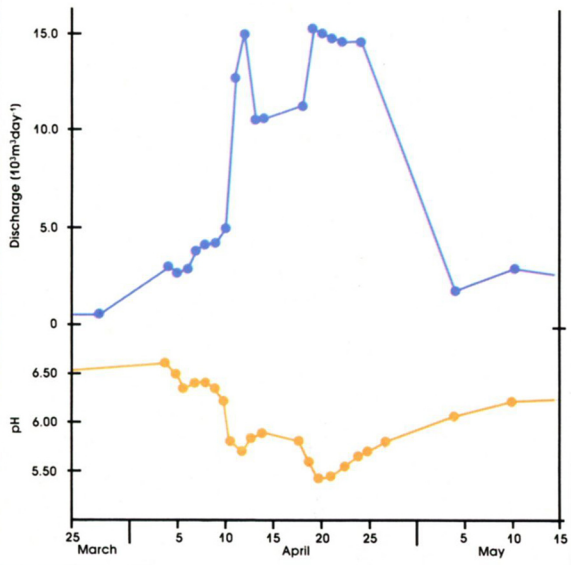
For almost half the year, most of northeastern North America is covered in a thick layer of snow. Hibernating among the snowflakes, waiting with the bears for springtime, is a potent dose of sulfuric acid that, when released in the spring runoff, packs the knockout wallop of a heavyweight prizefighter.

As the snow melts and enters lakes and rivers, parts of these bodies of water can become as much as 100 times more acidic in a very short time. "While this acid bath usually only lasts for a few days to a few weeks, the pH values are often acutely lethal, even in lakes that otherwise do not appear to be in danger," Dr. David Schindler of the Freshwater Institute in Winnipeg — a pioneer researcher into effects of acid rain on fish — told an Ontario government committee investigating acid rain. As an example, Dr. Schindler pointed out that Panther Lake in the Adirondacks normally has a pH of 7. But in the spring runoff it drops to a pH of 5.

Spring pH Depression of a Stream

Graph illustrating 'spring pH depression' in one of the six inflowing streams to Harp Lake a study lake in Muskoka. As the spring runoff increases the amount of water, the acidic melted snow causes the stream pH to drop, producing severe chemical 'shock' effects on aquatic life.

Source: Ontario Ministry of the Environment



Rite of Spring

"There were three of us that night. Toting flashlights and wearing high rubber boots, we tramped through the dripping woods to an obscure pond at the base of a low hill not far from Granby, Connecticut. It was the first warm, rainy night after a winter of heavy snows, and the low mists were filtering through the woods, reeking of primordial ooze and dark beginnings. Our intent was to find a pool of **Ambystoma laterale**, the rare and secretive blue spotted salamander."

John Mitchell, writing in **Country Journal**, says the trek to a small meltwater pond in Connecticut in the late 1960s to watch a mating ritual which had taken place for more than 10 000 years became for him an annual rite of spring. "In a small way it was a sort of symbol to us that, in spite of everything, all was right with the world."

But all was not right. Returning in 1975 after missing the trek for several years, Mitchell witnessed nothing. The salamanders were gone, wiped out by acid rain.

Amphibians, especially salamanders and frogs, are "the wildlife most drastically affected" by acid rain, says Kathleen Fischer of the Canadian Wildlife Service. The reason is that most amphibians lay their eggs in the meltwater pools of early spring, pools which are saturated with acid from the buildup over the winter.

Dr. Harvey Pough of Cornell University found that, "80 percent or more of the eggs fail to hatch in water with a low pH. That compares to a normal rate of anywhere from 5 to 10 percent."

In the vast delicatessen nature provides for birds and mammals, the salamander is considered a tasty little treat because it converts what it eats into a package of highly concentrated energy. "They play an essential role in the food chain," says Pough. "It would cause major effects on birds and mammals (such as skunks and shrews) if they were to disappear."

This indirect threat to wildlife is as much of a concern as the direct killing of the fish, amphibians, and plants in the water bodies. If the source of food for the loons, for example, disappears, then it and other aquatic birds will be in danger.

The loon, along with the wolf, is the epitome of the wilderness. "The call is almost wolflike to me," says research scientist Jack Barr. "I've heard them in conjunction at night and it's fantastically emotional and beautiful."

End of the Line

"Your fishing line would be hanging from the alder pole into the pondlike stillwaters. And then suddenly the surge of a trout would stretch your line taut and all at once your heart would seem to spread out like a fan, and you would know exactly what **trout**ness was, and **brook**ness. And **leaf**ness. And yes, **world**ness and **life**ness itself."

To writer Ernest Buckler and most of the other millions of anglers in North America, there is more to fishing than just dunking worms into the water to seduce hungry fish. "It's the great relaxation," says Rick Morgan of the Ontario Federation of Anglers and Hunters. "You can't go fishing and still worry about the pressures that shorten your life. It's just not possible."

But the pressures of acid rain are shortening and extinguishing the lives of fish and killing lakes and rivers. The economic consequences of that chain of events is felt by a long list of people, from cottagers whose property value (in dollars and in aesthetics) goes down, to fishing guides, lodge owners, outfitters and assorted business people who depend on tourism to survive.

Tourism is a $5 billion industry annually in Ontario. "My information is that $900 million of that comes from the heart of the acid rain belt," says Ross Howard, the author, with Michael Perley, of **Acid Rain: the North American Forecast.**

"If our tourism is wiped out, the whole area will become a virtual ghost town," says Bob Stinson of the Haliburton-Muskoka Chamber of Commerce. "I'm a resort owner and you know, you invest two or three hundred thousand dollars and you expect the place to take care of you for the rest of your life. You'd be better off if it burned down."

Statues and Architecture

For 2500 years the Caryatids, six marble maidens carved by the sculptor Phidias in the 5th century BC, supported the famous Erectheum Porch of the Acropolis, in Athens, on their delicate shoulders. Unflinching in the face of centuries of weather, wars, and old age, they graced the ruins of the ancient Greek capital with their noble sense of duty.

In 1977, however, the six maidens were removed to a museum and replaced with fiber glass replicas because their ancient marble was turning into soft gypsum. The reason? Air pollution, and particularly acid-causing pollutants. Acid rain.

In cities throughout the world, some of the oldest and most glorious architectural structures are being mutilated beyond recognition by acid rain. The ancient Egyptian granite obelisk, Cleopatra's Needle (circa 1500 BC), suffered serious surface flaking from two years of exposure to air pollution in New York City after surviving relatively unscathed for all those centuries in Egypt. The Parthenon, the Taj Mahal and the Colosseum in Rome are all suffering from this unnatural erosion. Landmarks such as the Lincoln Memorial and Washington Monument in Washington, gravestones, rock art, building surfaces and automobiles are all feeling the bite of constant acid washings. The President's Council on Environmental Quality estimated in 1979 that the annual cost to the United States in architectural damage was upwards of $2 billion.

Constant washings of acid rain erode the surfaces of many buildings, gravestones, works of rock art and automobiles. Architectural structures such as the Parliament Buildings in Ottawa, the Lincoln Memorial in Washington, the Acropolis in Athens, the Colosseum in Rome and the Taj Mahal in India have already suffered damage.

How Acid Rain Affects the Forests

". . . But only God can make a tree."
(He'll never try it in Sudbury.)

Raymond Souster's sardonic two-line poem is chiselled and carved invisibly on the bare rock and skeletons of trees in the area around Sudbury, Ontario. It is a fitting epitaph for the wasted and degraded land that has evoked so many unromantic visions of the moon. Here the direct effects of sulfur dioxide are at their extreme. "There were areas of very fine white pine that were completely killed," says Dr. Peter Rennie of the Canadian Forestry Service. "And most of the coniferous vegetation from a large geographical area has disappeared."

If a steady downfall of sulfur dioxide can cause this kind of environmental damage, what is the effect of a steady downpouring of sulfuric and nitric acid and dry deposition on forests, crops and soils?

A study by the United States-Canada Research Consultation Group reported in 1979 that "the rate of forest growth declined in southern Scandinavia and in the northeastern United States between 1950 and 1970," but although there were attempts to prove this was the result of acid rain, "it is not possible to demonstrate cause and effect unambiguously."

Perhaps not unambiguously, but there is enough evidence to make people like Dr. Rennie suggest that "we should not be depositing the amounts of sulfuric acids on the forests that we are doing at the moment." And for Dr. Ellis Cowling of the University of North Carolina to say that "we are sure there is removal of nutrients from foliage and from the roots of plants (by acid rain) and these are essential to the growth of plants."

That concern was echoed by an Ontario government committee investigating acid rain: "Serious and widespread soil and forest effects are expected over the next 25-100 years if the acidity of precipitation remains at a constant level," the committee concluded.

The possible negative effects on the terrestrial systems boggle the mind: everything from reduction in growth to damage to the foliage of plants and trees. The forest industry is the largest industry in Canada, worth $4 billion annually in eastern Canada alone, plus thousands of jobs. In the United States, it is one of the largest industries, and areas such as the Appalachian Mountains, with their magnificent hardwood forests, would be badly hurt by any loss in production.

"We might have a 20 percent loss in productivity in timber volume over a 20 year period followed by a progressively slower loss," says Dr. Rennie. "So that if one looked ahead to a 50 to 80 year period, we would have a steady impoverishment of the forest. We could have an overall loss in that period of 50 to 60 percent, which is rather formidable. One must remember," he adds, "that parts of north Africa were the grain growing areas for the Roman Empire. But those lands could not support grain at the present time because of the way they were cultivated and disturbed by man." The adverse effects of increased acidity in long-term soil productivity takes on added significance now that efforts are under way to cultivate forests, not simply to "mine" them.

Unless the amount of acid rain falling on forests in North America is drastically reduced, many forest areas will suffer severe damage in the next 25-100 years. The possible effects — everything from reduced growth to damaged foliage — could mean disaster to the forest industry, which is worth billions of dollars and thousands of jobs in Canada and the United States.

Crops and Soils

Experiments by the United States Environmental Protection Agency (EPA) have found that acid rain can cause damage to the foliage of crops such as spinach, lettuce, bush beans and radishes. And that the yield of certain crops (radish, beet, carrot, mustard green and broccoli) was reduced. Conversely, because of the fertilizing benefits of the acids, some crops showed an increase in yield, while others were not affected either way.

These experiments were conducted under simulated conditions, often with more severe doses of acid rain being administered than what is generally found under natural conditions. The conclusion reached by Dr. Norman Glass of the EPA is that "the jury is still out. More research, especially under field conditions, is needed." But within the scientific community there is a broad feeling that acid rain is definitely harmful to crops.

Direct information on what happens to soils is more sketchy. Many soils are well buffered and not in danger. But the soils in the Canadian Shield, where much of the forest industry takes place, are podzolic — naturally acidic — and sensitive to increases in acidity.

One of the main concerns is that potentially harmful elements such as aluminum and manganese, which are abundant in the soils of the Shield, will be released from the soil by the acid and prove to be toxic to plant life. "Aluminum would be my first concern," says Dr. Eric Beauchamp, a soil scientist at the University of Guelph. "It has a very great inhibiting effect on the growth of plant roots."

There is still a large question mark penciled beside the theories on how acid rain affects the terrestrial systems. Although there are those who feel little damage (if any) is being done, many others share the feelings of forest ecologist Dr. Thomas Siccama of Yale University, quoted in **Harrowsmith:**

". . . there are no hard findings to prove that acid precipitation changes the soil. The experimentation simply hasn't been done. But you go out to areas with unbuffered soils to look for changes and you see things. One area where we've seen this is in the Green Mountains of Vermont . . . It looks like there has been a 50 percent decline in the spruce tree population at higher levels in the Green Mountains over the past 16 years. There also seems to be a correlation between the acidity of streams and tree width in certain regions, with tree width decreasing as acidity of the streams increases. The inference is that something is wrong, but we don't know what. It looks suspicious."

Harrowsmith states there are many such indications. "What they see and what they fear is still speculation, still hypothesis — but it is informed, logical speculation."

Although there is still considerable debate about the damage acid rain does to soils, it is feared that unbuffered soils — those lacking in neutralizing elements will be adversely affected.

Danger to Human Health

"In parts of the Adirondacks people still get their drinking water through metal pipes," says Anne LaBastille. "The acid dissolves the metals and high levels of copper, lead and aluminum have been found."

As yet, there is little direct evidence of how acid rain affects human health, but there are enough clues and early warning signals to suggest that in the long run, the danger to human health may be a most serious consequence of not stopping acid rain.

As the winds carrying acidic substances speed across the countryside, other pollutants often hitch a ride: heavy metals such as mercury, lead, zinc and copper. These metals come from industrial emissions and automobiles and when they are deposited on lakes can be toxic to fish.

During a recent study of mercury in the Canadian environment, Griff Sherbin of Environment Canada found that about half way through the study, "it became obvious that something was wrong. We had fish with levels of mercury over the health standards but they were not near any known source of industrial pollution."

He concluded that mercury, mostly from fossil fuel combustion, was being transported through the atmosphere and deposited into lakes with abnormal levels of acid. When mercury reacts with the acid it converts into methylmercury, a very toxic form of mercury. And the result of eating a regular diet of fish containing methylmercury could be a real health concern.

Increased acidity also releases heavy metal from soils, and scientists appearing before an Ontario committee reported there are increased levels of heavy metals in lakes which are acidifying. "In cases where neither the acidity nor the metals are toxic by themselves," the committee's report also notes, "the combination can be deadly. Fish that are able to survive in waters with heavy metal concentrations are often unfit for human consumption." These heavy metals could also be a threat to human health if they exist in areas where drinking water is obtained from an untreated supply.

Before sulfur dioxide goes through its abracadabra change to sulfuric acid, a large amount of SO_2 falls to earth as dry particles. Dr. Leonard Hamilton of Brookhaven Laboratory in New York believes that these precursors to acid rain are breathed directly into the lungs and may cause chronic bronchitis and emphysema. After a seven year study he concluded that they have caused an increase in mortality rates — but some other scientists disagree.

What Can Be Done About Acid Rain?

A suffocating smog hovered over London, England, for several days in 1952, choking Londoners and reducing visibility to a noselength. Within two weeks the mortality rate had risen by 70 percent and 4 000 deaths were attributed to the smog — the product of human activity.

That dramatic incident, as well as others, resulted in attempts to clean up the air pollution in large, industrial cities. One of the methods adopted seemed simple and logical: build tall smokestacks to send the emissions high into the atmosphere where they could disperse among the clouds and be rendered harmless. The idea seemed to work as cities such as London benefited from the removal of the offending pollution. What was not known at the time, however, was that the act of sending the emissions high and far away gave life to a new problem — acid rain.

In the 1960s, Norway and Sweden discovered that their treasured environments were being ravaged by acid rain from Britain and Germany; and not long after it became apparent that both Canada and the United States were also suffering terrible damage from acid rain.

At present in North America, the worst hit areas are in the northeastern United States and eastern Canada. However, the problem is spreading and intensifying, and before long many other regions will feel the bite of the acid fallout. New England and Quebec, Wisconsin and Nova Scotia, Minnesota and Newfoundland will soon be joined by states and provinces in the west and south as more and more sulfur dioxide and nitrogen oxides are launched into the atmosphere and dispersed by the winds.

How can this be stopped? "The solution is very straightforward," says John Roberts, Minister of the Environment in Canada. "We must reduce drastically the amount of acid-causing pollution that is being emitted in both countries. I am told it is technically possible to effect such reductions. The only stumbling block is cost. How much and by whom?"

The technology does indeed exist. Emission controls can be placed on smokestacks and cars; and coal, which is a main culprit responsible for SO_2 emissions, can be washed in order to cut down on the sulfur sent into the atmosphere.

The argument against implementing these readily available solutions is that it will cost too much. The price tag is considerable; and in these days of high energy costs and belt-tightening budgets, both industry and government are cautious when it comes to spending money — especially on preventive medicine. But the cost of not taking action far surpasses the price of emission controls. Industries such as forestry, tourism, and fishing are threatened; building and automobile surfaces are deteriorating every day; health costs could be astronomical in the long run. At every turn there are jobs which could be lost and resources which may never be replenished. When the less tangible effects are added — the aesthetic losses, for example — the argument against not taking immediate action seems economically unsound and foolish.

What Can I Do?

"No one has the right at any time to endanger the environmental health of a nation or continent," says John Roberts. To that end, the Canadian and American governments have signed an agreement to begin the complex task of trying to stop the flow of acid rain across the international border.

Meantime citizens need not sit back passively and wait. If people make it known to government and industry that there can be no trade-offs for the environment, that they, as consumers, are not willing to let lower prices or convenience take dominion over the land, that message will be heard. They can convey that message directly to their elected representatives or they can actively support one of the many environmental groups. But if no cry is heard in the legislatures or in the corporate boardrooms, the people making the decisions that will affect the quality of life in North America for a long, long time may presume that they can act as they alone see fit.

"It's going to be very interesting to see," says Anne LaBastille. "It may just be the first time in human history where an environmental problem really brings people together because they realize we're one major ecosystem, we're under one roof and we must watch out and protect each other."

Additional Reading:

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Reports of the Canada-United States Work Groups set up under the Memorandum of Intent

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Epilogue

In the early 1920s, several members of the Group of Seven, Canada's foremost landscape painters, discovered the rugged, unspoiled beauty of the hills and lakes of the La Cloche Mountains in northern Ontario, near Sudbury. There, painters such as Frank Carmichael, A.Y. Jackson and A.J. Casson camped and painted, immortalizing the twisted jack pines and bell-shaped boulders; the windswept islands covered with ground hemlock and blueberry patches; and the mirrored waters of the tiny lakes lined with bulrushes and labrador tea.

In the 1960s, it was discovered that these lakes which had so inspired the Group of Seven were some of the first known victims in North America of the ravages of acid rain.

Legend has it that the La Cloche region is so named ("la cloche" is French for bell) because the Indians knew that certain rocks gave off a ringing sound when struck. The Indians used these rocks to warn of danger.

There were some unnamed lakes in the La Cloche Mountains in the 1970s. They named three of the them after members of the Group of Seven — Carmichael Lake, A.Y. Jackson Lake and Casson Lake. They named one Acid Lake.

La Cloche Panorama
Frank Carmichael
The McMichael Canadian Collection
Kleinburg, Ontario